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MAIZE GRANARIES IN MEXICO

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I. INTRODUCTION

THIS study attempts to follow the development of the maize granary, an important element of material culture, in Mexico where maize has been and still is the basic source of food. Sufficient information is now available to permit the presentation of a tentative outline of this development from the pre-Conquest period to the present day. Further anthropological and ethnobotanical studies along these lines may result eventually in the establishment of significant correlations between granary types and indigenous cultures. Such correlations would be of great value to scientists engaged in plant exploration, in connection with maize research of either a practical or a theoretical aspect, since Indian cultures have acted in part as isolating mechanisms resulting in the production and maintenance of maize ecotypes.

In the Western Hemisphere, maize was the cereal which served as the economic basis for civilization. Archaeological studies have brought to light various cultures with an incipient agriculture based on plants other than maize (Zingg 1939 and Anderson 1947); however, it was not until after the domestication and spread of

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maize that the South and Middle American civilizations were able to flourish. The widespread adaptation of maize agriculture resulted in a vital interdependence between this domesticated cereal and man. After domestication, maize could no longer subsist without the aid of man, and man himself relied more and more upon the product of this crop as his main source of food. This dependence on maize is still an outstanding characteristic of most of the Latin American countries today and of the Indian populations in particular.

It is probable that the problem of maize storage arose with the beginning of maize agriculture. With an increase in population resulting from an initial food surplus, maize storage took on an even greater importance. As the culture increased in complexity, this problem took on a group as well as an individual significance. By the time of the Conquest of Mexico, attention was devoted to the maize granaries by the rulers and priests, by the rich and the poor, by the craftsmen and the peasants. The tribal and family granaries represented a savings account which kept away disaster and maintained social vigor. Failure of the family granary meant slavery; failure of the tribal granaries meant social disintegration.

However, in spite of extensive cultural similarities among the Indian populations of Mexico, the development of the storage structures have followed various lines. Diversification in granary types resulted from: a) differences in climate, b) differences in materials available for construction, c) special cultural traits of the society, and d) variations in the cultural level.

II. THE PROBLEM OF MAIZE STORAGE

Maize became a dominant crop in the agricultural economy of the American civilizations because it possessed the favorable characteristics generally found among

the cereals. These are as follows: 1) the seed is a highly nutritive caryopsis, 2) the production of seed is highly efficient, 3) the seed can be handled and stored with ease, 4) the maize plant lends itself to the use of simple methods of cultivation, and 5) the plant has a wide tolerance to many and varied ecological conditions.

The nature of the seed favored its storage. However, the storage of the maize crop required special attention due to the following reasons: 1) several pests and diseases attack the grain, 2) a surplus stock would prevent the calamities of a poor crop, and 3) climatic variations often resulted in considerable decreases in yield.

No doubt the chief interest of the people was the production of an essential minimum amount of grain each year. This is suggested by the complex religious pattern centered around the maize theme, the interest in astronomy and its relation to the cultivation of maize, and the use of mixed seed of maize lines adapted to various climatic conditions. Once the crop had been obtained, it was necessary to protect it until the following harvest since this was periodical. In addition, the demands of a non-agricultural population, and the use of marginal and sub-marginal lands for agriculture due to population pressure, all stimulated the development of some method of storage.

Thus it is seen that the problem of storage was concomitant with the cultivation of maize. The method of storage could vary, but under any condition it necessitated the development of a special cultural pattern. The term maize granary is here used to designate the material element designed for the solution of this problem.

III. ARCHAEOLOGICAL PERIOD (circa 500–1100 A.D.)

Anthropological studies show that the Mexican Indian

cultures developed intricate religious patterns at an early stage. With an increase in populations and the flourishing of these societies, this tendency led to the establishment of a strong theocracy, later aided by rulers in charge of the secular functions of the group. Under these conditions, the cultures followed a dichotomous development; on the one hand, of the ruling classes and their magnificent material culture, and on the other hand, of the ruled masses with a less spectacular but more stable form of material culture which has persisted to date in many areas of Mexico.

It was not until recently that archaeologists began to pay attention to the cultural patterns of this larger part of the Indian population. The increased interest in pottery types indicates a tendency toward the study of this rich source of information. As it is, the recorded information on maize granaries from archaeological remains is extremely meager. The perusal of the extensive literature dealing with the impressive ruins in the Mayan area, San Juan Teotihuacan, Monte Alban, Mitla and La Venta, all undoubtedly of great religious importance, adds very little to an understanding of our particular problem.

S. Linné (1934) describes what are probably the oldest remains definitely related to maize storage. He writes of the results of his excavations of some of the smaller out-lying ruins of the ancient religious center at San Juan Teotihuacan, State of Mexico:

“While purely utilitarian pottery was almost entirely absent among the finds that were made below the floors of the ruin, it appears that almost all the vessels just described have served some practical purpose or other, e.g. for serving up food. There are also numerous fragments of storage vessels. These were generally of ovoidal shape, with a relatively narrow mouth, and from many of the fragments it is evident that the vessels often were of considerable size.”

As will be seen later, this method of storage was used

by the farmers of Mexico City at the time of the Conquest (Pl. XVI, A).

Archaeological studies in the Tarahumara region of northwestern Mexico, in the States of Sonora and Chihuahua, give a more complete picture of the methods used in storing maize. According to the works of C. Lumholtz (1902) and R. M. Zingg (1940), these are as follows: 1) underground cavities, 2) niches of caves walled in, 3) rectangular and cylindrical stone and mortar structures, 4) wattle and clay daub containers, and 5) vasiform structures made of coiled grass and clay daub.

In 1931, Robert M. Zingg carried out extensive studies in the Rio Fuerte region of southern Chihuahua. From the material obtained, he concluded (1940) that it represented a Basket-Maker and a Cave-Dweller cultural phase of the ancient Tarahumaras. The methods of maize storage used during the Cave-Dweller phase are those included above under numbers one to three. These are of special interest because they are still followed in part by the modern Tarahumaras, and they are not reported from any other group in Mexico.

During the Basket-Maker phase, Zingg finds "large bowl-like containers, 24'' in diameter and 8'' deep" having a funerary context but probably related also to an element used in the storage of maize. These containers "made by coiling rolls of grass imbedded in mud as binder" appear to Zingg as "a simplification of the coiled mud and grass storage structures of the Cliff Houses of the Casas Grandes archaeological phase of northern Chihuahua" described by Lumholtz (1902). These latter storage structures were found by Lumholtz at Cave Valley, close to Pacheco, and at Aros River, south of Chui-cuichupa, both localities in the State of Chihuahua within the Tarahumara region (Pl. XIII, A, B). Lumholtz showed them to be maize granaries which he related to

the vasiform granaries (*cuezcomatls*) found in use in 1902 in the central Mexican States of Tlaxcala and Veracruz. As this type of storage structure is used at the present time in Tlaxcala and Morelos, it seems that an uninterrupted sequence is present in the use of this type of granary from the archaeological to the present period.

Because of the relationship of these forms of granaries, it is of interest to include the description of the structures (Plate XIII) discovered by Lumholtz (1902):

“The most unique feature of this cave, however, is the cupola-shaped structure which stands in an open space in front of the house group, near the mouth of the cave, but still under its roof. Its height, measured inside, is twelve feet, and its widest inside diameter is eleven feet. Its walls average eight inches in thickness. It has one aperture three feet wide at the top, another one of the same diameter near the base, and there are several others nearly opposite each other. In the two upper ones are seen distinct impressions of timber in the plaster.

“The building was made by twisting long grass into a compact cable and laying it up one round upon another. As the coil proceeded, thick coats of plaster were laid on inside and outside. This plaster, which is the same material as that of which the houses are constructed, got thoroughly mixed with the straw during the process of building, and the entire structure was finished without any opening except the one at the top. The other apertures were undoubtedly cut out afterward. There is no trace of withes or other binding material to hold the straw cables in place. They are kept in position only by the plaster, which here, as in the houses, is almost as hard as the conglomerate of the surrounding rocks.”

Further on he adds:

“Two of them were deeply sunken into the floor of the cave, and inside of them we found between the rubbish and debris that filled them, several grains of corn and some beans.”

A study of the findings of Isabel Kelly (1947) at Apatzingan, Michoacan, along the Pacific coast of Mexico, suggests the presence of remains which may be the foundations of granaries similar to those now in use along the coast of Guerrero. However, a sufficient knowledge is lacking for accurate determination.

SUMMARY—ARCHAEOLOGICAL PERIOD (500–1100 A.D.)

<i>Granary Type</i>	<i>Indian Group</i>	<i>Distribution</i>
1. Subterranean	Tarahumara	Sonora and Chihuahua
2. Niches of caves	Tarahumara	Son. and Chih.
3. Rectangular and cylindrical, stone and mortar	Tarahumara	Son. and Chih.
4. Wattle and clay daub	Tarahumara	Son. and Chih.
5. Vasiform, coiled grass and clay daub	Tarahumara	Son. and Chih.
6. Clay jars	Teotihuacan	San Juan Teotihuacan, Mex.

IV. PRE-CONQUEST PERIOD (1100–1518 A.D.)

For a knowledge of the cultures found in Mexico at the time of the Conquest, two extensive sources of information are available: a) the Codicis, and b) the writings of men who lived in Mexico during the few decades following the Conquest. It seems reasonable to assume that these historical documents refer to cultural traits of a well-established pattern which remained unchanged for some time after the Conquest. For this reason, this information is interpreted as a reflection of conditions existing previous to the Conquest.

The Codicis are a form of pictorial writing used by the Mexican tribes to record such information as tribal history, rights to land ownership, commercial transactions and tribute lists. The pictorial technique varied widely probably as the result of a constant development from pure pictorial representation to a semi-phonetic writing. Of the Codicis which escaped destruction, the most important ones to our problem are the Codex Mendoza, the Historia Chichimeca, the Yanhuitlan Codex, the Codex Troano-Cortesiano and the Lienzo de Tlaxcala.

The information gleaned from these sources may be divided into two categories: a) one referring to the storage structures used by the rulers, and b) the other re-

ferring to the maize granaries of the farmers and craftsmen. In most cases the same type of granary was used by both classes, but the small family granary types are the ones that have survived and give a distinctive appearance to many of the Indian communities of present-day Mexico.

A. Imperial Granaries

Bernal Diaz del Castillo (1568) gives an insight into the organization of the palace of Moctezuma when he states:

“Dejemos de hablar de la costa y comida de su casa, y digamos de los mayordomos y tesoreros y despensas y botelleria y de los que tenian cargo de las casas adonde tenian el maiz.”

Thus we learn that Moctezuma had overseers and “treasurers” who were in charge of the ruler’s pantries, “wine” rooms and houses where maize was stored.

Fr. Bernardino de Sahagun (1529–1590) amplifies this information in his section dealing with the warehouses of the Aztec ruler wherein he writes:

“Otra sala del palacio se llamaba petlacalco. En este lugar posaba un mayordomo del señor, que tenia cargo y cuenta de todas las trojes de los mantenimientos de maiz que se guardaba para proveimiento de la ciudad y republica, que cabian a cada dos mil fanegas de maiz, en las cuales habia maiz de veinte años sin dañarse; tambien habia otras trojes en que se guardaba mucha cantidad de frijoles.”

In addition there were other warehouses (*trojes*) for salt, peppers and two kinds of pumpkin seeds.

As much of the imperial supplies was obtained as tribute exacted from the towns under the Aztec domination, the Codex Mendoza (Kingsborough 1831–1848, Long 1942) is an important source of information. This Codex was made by order of Don Antonio de Mendoza, Viceroy of Nueva España from 1535 to 1550, and was intended for King Charles V. It was painted by Mexican

artists and the pictorial technique shows no Spanish influence. It is believed to be a copy of an older Codex made in 1511 to record Moctezuma's tribute list. Throughout this document, the measure of the tribute to be paid in terms of maize, beans, chia (*Salvia hispanica*) and quautli (*Amaranthus caudatus*), is indicated as a large wooden granary of the log-cabin type.

Other authors writing at a much later period suggest that the following two types of granaries were also used by the Aztec rulers: large cask-like containers made of wattle and clay daub and kept within the rooms of the palace (Torquemada 1723); and *cuezcomatls* (vasiform granaries) according to Fray Alonso de la Mota y Escobar (Simpson 1934).

The following four types of imperial granaries may therefore be recognized:

1. Rooms within the palace. This type of storage is described by Diaz del Castillo (1568) and Sahagun (1529–1590).

2. Log-cabin granary (Pl. XIV, A). In 18 of the plates of the Codex Mendoza (Kingsborough 1831–1848) a total of forty of these figures are illustrated, and in all cases the Spanish text refers to them as "troxes." All are strikingly similar and seem to represent a cubical structure consisting of low corner posts, a plank floor, log or board walls interrupted at about the middle by a circle, and a plank roof. The representations of various types of grains are drawn above the figures of these structures, and it is evident, from the rest of the information given, that these granaries were used as measures of the yearly tribute which had to be given to the Aztec ruler. There is no indication regarding the manner in which the walls were held together at the corners, and

it seems best to regard this lack of detail as a simplification leading to economy of effort on the part of the artist. The color and position of the circle on the front wall suggest a small wooden door similar to the one found in log-cabin structures common among the Mixtec Indians today.

Anderson and Barlow (1943) made a special study of these figures, and their findings may be summarized as follows: the figures represent large wooden granaries with a capacity of four or five thousand "fanegas" (about 10,000 bushels); these "troxes" were used as units of measure of the yearly tribute required of the various provinces in terms of maize, beans, chia and quautli; these granaries were built at strategic localities throughout the Valley of Mexico and into Oaxaca as far as Oaxaca City.

Finally, at a late date Francisco Saverio Clavijero (1780) gives a full description of this type of granary and his description is included since it has been repeated by Prescott (1843), Brasseur de Bourbourg (1858) and Bancroft (1875).

"Eras, y Graneros. Tavian eras para deshojar, y desgranar las mazorcas, y graneros para guardar el grano. Estos eran cuadrados, y por lo comun, de madera. Servianse para esto del *ojametl*, arbol altisimo, de pocas ramas, y estas mui delgadas, de corteza tenue, y lisa, y de contestura flexible, pero dificil de romperse, y rajarse. Formaban el granero, disponiendo en cuadro, unos sobre otros, los troncos redondos e iguales de *ojametl*, sin otra trabazon que una especie de horquilla en su estremidad, para ajustarlos, y unirlos tan perfectamente, que no dejasen paso a la luz. Cuando llegaban a cierta altura, los cubrian con otra trabazon de pinos, y sobre ella construian el techo, para defender el grano de la lluvia. Estos graneros no tenian otra salida que dos solas ventanas, una pequena en la parte inferior, y otra grande en la superior. Los habia tan espaciosos que podian contener cinco mil, seis mil, y aun mas fanegas de maiz."

He goes on to say that some of these structures were

still to be found in places at some distance from the capital (Mexico City) and that they seemed old enough to have been constructed before the Conquest.

3. *Cuezcomatls*, vasiform grass and daub granaries. In 1609, Fray Alonso de la Mota y Escobar (Simpson 1934) includes the following statement in his memoirs with reference to San Juan Cuezcomatepec, a village 25 kilometers northwest of Cordoba, Veracruz:

“Habla en este pueblo lengua mexicana perfecta llamase en ella *Cuezcomatepec* que suena el pueblo de los troxes porque dizen las tenia aqui *Motezuma* de mucha cantidad de mahiz que por ser tan frio y seco se conseruaua aqui como en deposito para los tiempos de sus hambres.”

As will be shown later it seems reasonable to assume that the Indian word *cuezcomatl* refers to the vasiform type of granary.

Most students of the Nahuatl language indicate that the etymology of the word *cuezcomatl* is not known. From a very ancient period the word has meant a granary and *cuezcomatl* has been used as a root word in the composition of other words. However, Siméon (1885) writes in his *Dictionnaire de la Langue Nahuatl*:

“*Cuezcomatl*, s. Havre-sac, magasin de pain; sommet de la tête, crâne. En comp. *nocuezcon*, mon crâne; *tocuezcon*, notre crâne, le crâne en general. Avec les postp. *c*, *tlan*: *cuezcomac*, dans le havre-sac, dans le grenier; *cuezcomatitlan*, parmi les havre-sacs.”

While Garcia Cubas (1888–1891) adds that *comatl* means *vasija* or container. It seems then that *cuezcomatl* might mean a container in the form of a skull. A study of Pl. XIII, the vasiform grass and daub granary of the ancient Tarahumaras related to the present-day granaries, suggests the possible reason for the use of this word for these structures.

4. Wattle and daub cask-like granaries. Torquemada (1723) has a chapter in which he relates the looting of

“Moctecuhcuma’s” warehouses by the Indian allies of Cortes and by Pedro de Alvarado. Of the containers in which the royal supplies were kept, he says:

“Estaba el Cacao en unas Vasijas hechas de Mimbres, tan grandes como Cubas, que seis Hombres no las podian abarcar; estaban embarradas por de dentro, y por de fuera, y asentadas por orden, como Cubas; servian de Troxes para el Maiz, y otras Semillas, y se conservaban bien en ellas. . . .”

B. Family Maize Granaries

The information recorded about the family maize granaries of this period presents for the first time the extreme diversity which is to be expected in this country of numerous Indian cultures.

a. Permanent and semi-permanent family granary types

1. Niches of caves. The use of this method of maize storage is not reported for this period, but undoubtedly it was in use among the Tarahumara Indians since it has been found among them during the Archaeological Period and the 19th Century.

2. Rectangular and cylindrical stone and mortar structures. The same may be said for this type of granary as has been said for the previous type.

3. Wattle and clay daub. Probably in use among the Tarahumara, as a similar reasoning holds for this type as for Type 1.

4. *Cuezcomatl*, vasiform grass and daub granary (Pl. XIV, B, C, D). Several of the town names included in the Codex Mendoza (Kingsborough 1831-1848) and the Historia Chichimeca (Boban 1891) are combinations utilizing the Indian word *cuezcomatl*. As this is the

name used at present for the vasiform granaries in the States of Tlaxcala and Morelos, a special study was made of the town glyphs in the Codicis. Those for Cuezcomatlyyacac (Cuezcomatl iyacac), Cuezcomayxtlahuacan, Cuezcomahuacan and Cuezcomatitlan all consist of a dominant vasiform figure with the following characteristics: a) the structure seems to rest on a rectangular foundation built on top of roundish stone corner supports, b) the vasiform figure is divided by several horizontal lines suggesting a structure made of several sections, and c) the top of the structure is shown as an open circular mouth except in Cuezcomatlyyacac in which a sort of round lid is indicated.

Wherever interpretations of the town glyphs are made, *cuezcomatl* is translated as *troxe*, *granero* or granary. For instance, Clark (1938) gives the following meanings in his analysis of the Codex Mendoza:

Cuezcomahuacan: place of granaries

Cuezcomayxtlahuacan: place of the plain of bins

Cuezcomatitlan: amongst the granaries

Cuezcomatliyacac: in the beginning of the granaries

It seems then that the farmers of the Mexican central plateau at the pre-Conquest period were using a vasiform maize granary which is related to the archaeological remains of the Tarahumara and to the present day *cuezcomatls* of Tlaxcala and Morelos.

Sahagun (1529–1590) suggests the use of this type of granary when he writes:

“De algunos zazamiles de los muchachos que usa esta gente mexicana, que son los ‘que cosa y cosa de nuestra lengua’ (Acertijos).? Que cosa y cosa una vieja que tiene los cabellos de heno, y esta cerca de la puerta de casa? Es la troje de maiz.”

Torquemada (1723) also seems to refer to this type of granary when, in speaking of the custom of punishing

those who stole maize from the granaries, he states that these "troxes" are like very large vessels (*tinajas*) with their mouths on the uppermost part and anyone wishing to take out the contents must climb into it. The Lienzo de Tlaxcala (Anonymous 1892) includes two perfect representations of these granaries.

5. Clay jars (Pl. XVI, A). This figure reproduced from the illustrations which form part of the work of Sahagun (1529-1590) depicts the cycle of activities of the good farmer. The storage of the harvest in large clay jars is clearly shown.

In the northwestern part of Mexico, among the Cahita-speaking Indians, today represented by the modern Yaqui and Mayo of southern Sonora and northern Sinaloa, Beals (1943) has found that during the pre-Conquest period maize sometimes "was cached underground in pottery vessels stoppered with clay."

6. Log-cabin type of granary. Plate XVI, B, reproduced from Sahagun (1529-1590), shows the storage of the maize harvest by a Mexican family. The granary consists of stone corner posts, a base made of boards or planks, and walls of logs or boards placed horizontally. Economy of detail on the part of the artist may account for the lack of detail as to the method in which the corners were formed. Two stones shown at the upper corners of the structure probably refer to rocks used to hold down the thin board or wooden shingle roof. The dimensions of the front wall as shown must be about 5 by 8 feet.

In spite of the marked differences already noted between the rulers and the lower economic classes in the Mexican Indian cultures, it seems reasonable to assume that the richer agricultural families tended to use the same type of granaries as utilized by the tribal rulers. For

this reason, the use of the wooden log-cabin type of granary by the family group is also confirmed by the information given in the Codex Mendoza (Kingsborough 1831-1848) and the Yanhuitlan Codex (Jimenez Moreno and Mateos Higuera 1940) which will be discussed later.

7. *Cincalli*, highland crib. A characteristic crib-like wooden granary known as *cincalote* is used today in a limited area to the south of Mexico City (Pl. XVIII, A). Sahagun (1529-1590) seems to refer to this type of granary when, in describing the feasts and ceremonies observed by the lapidaries, he states:

“Al otro que se llamaba Cinteotl tambien le componian como a varon, con una caratula labrada como mosaico, . . . y ponianale en un tablado alto de donde estaba mirando, el cual se llamaba cincalli, compuesto de cañas de maiz a manera de jacal;. . . .”

b. Temporary methods of maize storage

1. *Rafters*. Sahagun (1529-1590), describing the habits and labors of the Mexican farmer born under the favorable sign Ce Tochtli, says that he was diligent, hard-working, careful of his crops and:

“asi abundantemente cogia de todas maneras de legumbres y henchia su casa de todas maneras de maiz, y colgaba por todos los maderos de su casa sarteles de maiz. . . .”

2. *Tapanco*, loft and interior of the house. This method of storage is reported to have been in use among the Cahita Indians (Beals 1943) who inhabited the dry semi-tropical coastal plains of Sonora and Sinaloa.

3. *Enramada*. Beals (1943) finds that the Cahita Indians also stored maize on the cob on *enramadas* which are raised platforms built as separate structures or as annexes to the front of the native houses (Pl. XXI, C, D).

With regard to the Mayan groups, the methods of maize storage during this period are unknown. The *Codex Troano-Cortesiano* suggests the use of clay jars, but no definite information is available.

SUMMARY—PRE-CONQUEST PERIOD (1100-1518 A.D.)

<i>Granary Type</i>	<i>Indian Group</i>	<i>Distribution</i>
A. Imperial Granaries		
1. Rooms within palace	Aztec	Valley of Mex.
2. Log-cabin granary	Aztec	Valley of Mex.
	Mixtec	Mixteca of Oax.
3. <i>Cuezcomatl</i> , vasiform, grass-daub	Aztec	Valley of Mex.
	Mazapan	Puebla
	Tlaxcalan	Tlaxcala
4. Cask-like, wattle-daub	Aztec	Valley of Mex.
B. Family Granaries		
a. Permanent and semi-permanent structures		
1. Niches of caves	Tarahumara	Son. and Chih.
2. Rectangular and cylindrical, stone and mortar	Tarahumara	Son. and Chih.
3. Wattle and clay daub	Tarahumara	Son. and Chih.
4. <i>Cuezcomatl</i> , vasiform, grass-daub	Tarahumara	Chihuahua
	Aztec	Valley of Mex.
	Mazapan	Puebla
	Tlaxcalan	Tlaxcala
5. Clay jars	Aztec	Valley of Mex.
	Cahita	Son. and Sinaloa
	Mayan (?)	Yucatan (?)
6. Log-cabin	Aztec	Valley of Mex.
	Mixtec	Mixteca of Oax.
7. <i>Cincalli</i> , highland crib	Aztec	Valley of Mex.
b. Temporary methods of storage		
1. Rafters	Aztec	Valley of Mex.
2. <i>Tapanco</i> , loft and interior of house	Cahita	Son. and Sin.
3. <i>Enramada</i>	Cahita	Son. and Sin.

V. IMMEDIATE POST-CONQUEST PERIOD (1520-1600 A.D.)

Fundamentally the main social change which took place from the pre-Conquest to the Conquest periods consisted of a substitution of a Spanish theocratic-colonial government for the native theocratic-tribal ruler organization. As far as the Indian population was concerned, one master was substituted for another. The established rhythm of activities continued almost unaltered, in spite of the localized demands for Indian labor to work the mines. Various crops were introduced at this time, but maize continued to be the main source of food, and undoubtedly the methods of maize storage of the preceding period were also in use at this time by the family groups.

The establishment of the Encomienda system of land holdings placed the favored Encomendado in the position of exacting tribute from the Indian groups under his control. With regard to the storage of maize under the Encomienda, the Yanhuitlan Codex contains some valuable information. This Codex has been described in detail by Jimenez Moreno and Mateos Higuera (1940), and Anderson and Finan (1945) have added some pertinent data. It shows a large log-cabin type of structure used as a measure for the amount of maize which the people of Yanhuitlan, Oaxaca, were obliged to produce for the Encomendado Don Domingo in order to satisfy what was prescribed in the required valuation made by the Viceroy Don Antonio de Mendoza on October 26, 1548. This structure is very similar to the wooden log-cabin type of granary still in use in this region of the Mixtec Indians (Pl. XVII, D).

SUMMARY—IMMEDIATE POST-CONQUEST PERIOD (1520-1600 A.D.)

In spite of the Conquest, the agricultural Indian population of Mex-

ico continued to use the same types of maize granaries as those existing before the Conquest. The granary system of the Indian rulers came to an end shortly after the Conquest, but the new Encomienda system began using some of the same methods of maize storage. The only definite information in this regard is that given for the use of the wooden log-cabin type of granary used in the Encomienda of Yanhuitlan, Oaxaca, among the Mixtec Indians.

VI. LATE 19th CENTURY PERIOD

With regard to the study of maize granaries, the only important change after the political independence of Mexico was the substitution of the Hacienda system for the Encomienda. In general, the Indian population continued to use its characteristic methods of maize storage. However, the prolonged absence of a definite tribal organization and the increase in the non-Indian population resulted in a gradual mixing of granary types, a degeneration in building techniques, the introduction of foreign elements, and the disappearance of Indian granary types over large areas of Mexico.

A. Hacienda Granaries

Very little information is available as to the methods of maize storage under the Hacienda system. It is to be expected, however, that these would show a strong foreign influence.

1. Conical stone and mortar structures. These remarkable granaries, recently photographed by P. C. Mangelsdorf (Pl. XIX, A, B), are found in a small area in the States of Aguascalientes, Zacatecas and Jalisco (I. Kelly, in correspondence). These conical structures have walls of adobe faced with lime mortar and small stones. They have a winding stairway on their outer surface leading to an inlet close to the apex. A large rectangular door at the base serves for the removal of the

grain. Their conical shape gives them a high mechanical efficiency for the storage of grain. It is estimated that the larger structures have a capacity of about eighty metric tons. Their relationship to indigenous or foreign structures is unknown.

2. Cubical stone and mortar warehouses. L. Hernandez Xolocotzi (in correspondence) reports that during this period, the Haciendas of Tlaxcala used warehouses which consisted of masonry walls one meter in thickness forming large rectangular rooms 20 meters in length and 8 by 8 meters on the side, with ventilating holes close to the roof.

B. Family Maize Granaries

Three men in particular have published extensive and comprehensive descriptions of the maize granaries in Mexico in their reports of archaeological expeditions during the final years of the 19th Century: A. F. Baudelier (1884), C. Lumholtz (1902) and F. Starr (1894, 1899, 1899-1900, 1901-1903, 1908).

a. Permanent and semi-permanent structures

1. Niches of caves. Lumholtz (1902) reports this method of maize storage among the Tarahumara Indians at Yepochic, Chihuahua.

2. Rectangular and cylindrical stone and mortar structures. This type of granary was used among the Tarahumara of Sonora and Chihuahua, and the Huicholes of Nayarit (Lumholtz 1902). Of the Huicholes at Batista, Nayarit, Lumholtz writes:

“The corn when shelled is kept in round store-houses made of stone and mud. It is put in from above, and taken out through an opening near the ground, a stone serving as a door for this aperture, which is

kept tightly closed. The store-houses are very small, as the Huicholes harvest only from four to five fanegas of corn a year."¹

3. *Cuezcomatl*, vasiform grass-daub structure. This type of granary (Pl. XV, A), previously described from the Tarahumara area and the Mexican central plateau, seems to be confined during this period to the States of Tlaxcala, Puebla and Veracruz (?). Its apparent absence from Morelos is probably due to lack of information.

Lumholtz (1902) compares the archaeological remains of the Tarahumara area with the vasiform granaries which he saw in Tlaxcala and Veracruz. There is some doubt as to its occurrence in Veracruz, however, as it is not mentioned in use in that State in the writings of Bandelier and Starr, nor is it found there at the present time. Its use in Tlaxcala and Puebla is reported by Bandelier (1884) at Huexotzingo, Santiago Xaltepetlapan and San Simon Tlalniconla. It is Starr (1899, 1899-1900), however, who gives a complete picture of this type of granary through his descriptions and numerous illustrations. He found this granary near Cholula, Puebla, and throughout Tlaxcala. He writes (1899):

"The *cencalli* in Tlaxcala is of a characteristic form and bears the special name of *cuezcomatl*. It is a vasiform construction of adobe or of clay which rises to a height of from five to ten feet. . . . Above this base rises the great rounded and hollow body, open above; over this a neat, little, two-pitched roof of thatch serves to shed rain. The *cuezcomatl* is a storehouse or granary for maize on the cob."

4. Log-cabin type of granary. The use of this general type of granary is reported from an extensive area in Mexico. It is found among the Tarahumara of Chi-

¹Fanega: "The modern Spanish fanega has been equated to 1.6 English bushels, which would be slightly over 2 American bushels. For Mexico 2.5 American bushels is a conservative equivalent." (Anderson and Barlow 1943.)

huahua and the Tepehuanes of northwestern Durango (Lumholtz 1902), the farmers of Puebla, who call it *cen-calli* or house of ripe corn (Bandelier 1884), and the Mixtecs at Tilantongo (Pl. XVII, A) and Yodocono, Oaxaca (Starr 1899, 1899–1900, 1908). However, several minor variations occur from place to place.

Variations to the general type are as follows:

a) the roof circular in outline; among the Triquis of western Oaxaca, in the Districts of Tlaxiaco and Juxtlahuacan (Starr 1899, 1899–1900).

b) the roof on independent pillar posts; among the Zoques at Tuxtla Gutierrez, Chiapas (Starr 1899–1900).

c) the whole structure on tall corner pillars (Pl. XVII, B); among the Mixes of Oaxaca, in the towns of Ayutla, Quesaltepec, and Ixcuintepec (Starr 1899, 1899–1900, 1908).

d) the whole structure on tall corner pillars and the thatched roof with ridge pole extending into the air (Pl. XVII, C); among the Mazatecs of Oaxaca, Districts of Cuicatlan and Teotitlan (Starr 1899–1900), and the Cuicatecs and Chinantecs of Oaxaca (Starr 1899–1900).

5. *Cincalli*, highland crib. *Cincalli* means house of maize in Nahuatl. *Cincalote*, an evident corruption of *cincalli*, is the name used by the Otomi Indians living just south of Mexico City for their crib-like granaries. As early as 1899, Starr illustrated these characteristic structures from Huixquilucan, State of Mexico (Pl. XVIII, A).

6. Cylindrical granary of upright poles and circular roof (Pl. XX, A). This type is reported among the Triquis of Oaxaca (Starr 1899–1900).

7. Maguey hut type of granary. This structure, made almost entirely from the various parts of the maguey or century plant, was found in use as a maize granary among the farmers of southern Puebla and northern Oaxaca in a markedly semi-arid area (Bandelier 1884).

8. Cylindrical or square open granaries with upright poles. This type of semi-permanent structure is reported in use among the Tepehuanes of Durango (Lumholtz 1902).

b. Temporary methods of storage

1. *Tapanco*, loft and interior of house. It seems that the following Indian groups used this method of storing maize, as no other type of granary is known among them; Tarascans of Michoacan; Zapotecs, Huaves and Chontales of Oaxaca; and Totonacs of northern Veracruz.

2. Conical container made of maize stalks (Pl. XXII, A). While describing the granaries found in Puebla, Bandelier (1884) writes:

“In the Plain, I have also seen storehouses made of cornstalks, set vertically, and tied to an inner frame, or forming a conical hollow stack. But such frail structures are temporary, and mostly used for maize only.”

SUMMARY—LATE 19th CENTURY PERIOD

<i>Granary Type</i>	<i>Indian Group</i>	<i>Distribution</i>
A. Hacienda Granaries		
1. Conical, adobe and mortar		Aguas., Zac., Jal.
2. Cubical, stone and mortar		Tlaxcala
B. Family Maize Granaries		
a. Permanent and semi-permanent structures		
1. Niches of caves	Tarahumara	Son. and Chih.

2. Rectangular and cylindrical, stone and mortar	Tarahumara ; Huicholes	Son. and Chih. Nayarit
3. <i>Cuezcomatl</i> , vasiform, grass-daub	Tlaxcalan Cholulan	Tlaxcala Puebla Veracruz (?)
4. Log-cabin	Tarahumara Tepehuanes Cholulan Mixtecs	Chihuahua n.w. Durango Puebla n.w. Oaxaca
a) circular roof	Triquis	western Oaxaca
b) roof on independent pillars	Zoques	Chiapas
c) granary on tall corner pillars	Mixes	central Oaxaca
d) granary on tall pillars with projecting ridge pole	Mazatecs ;Cuicatecs ;Chinantecs	northern Oaxaca
5. <i>Cincalli</i> , highland crib	Otomi	s. Mexico State
6. Completely cylindrical	Triquis	w. Oaxaca
7. Maguey hut	?	s. Pue., n. Oax.
8. Cylindrical or square open structures	Tepehuanes	Durango
b. Temporary structures		
1. <i>Tapanco</i> , loft and interior of house	Tarascan Zapotecs ; Huaves ; Chontoles Totonacs	Michoacan eastern Oaxaca northern Veracruz
2. Conical container, maize stalks	Cholulan	Puebla

VII. MODERN PERIOD

Many writers have dealt with the anthropological aspects of the various Indian cultures of present-day Mexico, and yet, the published material on maize granaries and methods of storing maize is very meager. The author has obtained extensive information with regard to these problems while engaged in plant exploration work in connection with the plant breeding program of the Oficina de Estudios Especiales of the Mexican Department

of Agriculture. The greater amount of this data has been obtained from the States of Tabasco, Veracruz, Chiapas, Oaxaca, Guerrero, Morelos, Tlaxcala and Puebla. It is included in this section in its proper place.

A point of special interest is the fact that not until this period is reached does the method of maize storage in the extensive area inhabited by the Mayan groups become known. This condition may be the result of the following factors: a) the lack of stimulus in this area to develop permanent granaries due to the possibility of obtaining more than one harvest of maize during the year and of replacing a shortage of maize with sweet potatoes and cassava, b) a lack of remains due to the perishable nature of the structures built for storage, and c) the tendency of archaeologists to concentrate their attention on the more spectacular elements of the Mayan civilization.

A. Permanent Hacienda Granaries

1. Cylindrical masonry structure. Eizi Matuda (in correspondence) writes that in the coffee Finca area of southern Chiapas large permanent granaries are necessary to store the supply of maize required to supply the needs of the large Indian population hired during the coffee harvest. These granaries consist of cylindrical structures made of mortar and stone. Usually a suitable slope is cut away leaving two terraces. The granary, having dimensions of 1.5 to 2 meters in diameter and 5 to 6 meters in height, is built against the intermediate wall of the terraces. This location facilitates introduction of the grain through an opening at the upper level and removal through a door located at the lower level or terrace.

B. Family Maize Granaries

a. Permanent and semi-permanent structures

1. Cylindrical stone and daub. The studies by Bennett and Zingg (1935) among the Tarahumaras of northwest Mexico include full descriptions of the maize granaries and the technique of construction. They write:

“The cornhouses of the gorges appear to be a hold-over of the more ancient type of structure made of stone-in-mud-mortar. This type is seen in the highlands only in archaeological sites. But the cornhouses of the *barrancas* are not situated in caves. They usually stand upon large boulders, several near a dwelling. . . . With a boulder for a base, a circular wall of stone-in-mud-mortar is erected. It is about 4 feet in diameter and 5 feet high. Some have rather flattened fronts which contain the door.”

2. *Cuezcomatl*, vasiform grass and daub. Two variations of this type are found and they are here designated as the Tlaxcalan and the Morelos forms; however, they represent a single phase of cultural development. The Tlaxcalan *cuezcomatl* (Pl. XV, B) is a vasiform structure consisting of thick walls made of grass and daub and the whole capped by a sloping flat or two-pitched roof of woven grass or of pine shingles. The entrance is through a rectangular cut made on the rim of the wall at the mouth, just below the high pitch of the roof. Maize on the cob is stored in these granaries.

The Morelos *cuezcomatl* (Pl. XV, C) is very similar except that the upper part of the structure and the roof are made of overlapping layers of grass, with an inverted clay pot often topping the apex (Linné 1938). Entrance is through a small semi-circular gable-like opening near the top. Shelled maize is stored in these granaries and removal is through a small hole close to the base. Both of these highly specialized forms of granaries are disappearing rapidly.

Luis Hernandez Xolocotzi, owner of one of the few remaining Tlaxcalan *cuezcomatls*, writes (in correspondence) that these structures are made as follows: first, a solid stone and mortar foundation is built half a meter below the ground and a half meter above; then, a good supply is made of loaf-like units, each about one meter in length, consisting of long grass stems (*Elyonurus ciliaris* HBK) well kneaded in clay; these units are placed, while still partly moist, in an overlapping fashion around and around to form the thick circular walls of the granary; finally, the wall is faced on both sides with a heavy coating of daub. He adds that formerly coiled grass cables were used to construct small *cuezcomatls*. There is no doubt, therefore, that a positive relationship exists between the archaeological granaries of the Tarahumaras, the *cuezcomatls* of the Codicis, the 19th Century reports and the modern structures of Tlaxcala and Morelos.

3. Highland log-cabin. This type of granary is found in use among the Tarahumaras of northwest Mexico and the Mixtecs of northwest Oaxaca. Bennett and Zingg (1935) give the following description of this structure:

“The most compact and carefully made structures of the Tarahumaras are the storehouses for grain, which may be as large as 10 feet high and 8 feet square. The walls are made of well-hewn boards notched to fit very closely. The foundation of these structures is usually made of beams supported by four stones to prevent moisture from entering the interior. . . . Above these floor boards, carefully notched and fitted boards are placed on edge to form the side walls in log-cabin fashion. . . . Above the walls is a ceiling (*pola*, Tara.), made of close-fitting boards like those used for the floor. . . . Very clever locking devices are used to prevent easy access to the interior and robbery.”

The Mixtec form found near Nochistlan is very similar to the one described above. It adds a palm-thatched two pitched roof, thus providing a loft which is also utilized for storage.

4. Yanhuitlan log-cabin. This type (Pl. XVII, D) is treated separately because of its possible relationship to the pictorial representation found in the Yanhuitlan Codex. Only one of these structures was found in Yanhuitlan, Oaxaca. The walls are made of heavy pine boards with interlocking corners. The roof is of mortar and brick. A small rectangular door with a trick locking device is located high on the front wall.

5. Lowland log-cabin. Several granaries of the log-cabin type have been found at Zumpango del Rio, in central Guerrero and at Real de Guadalupe, La Parota and El Anonal in the southwestern part of Guerrero. It is the common type of granary at Zumpango where it is made of *zoyate* palm trunks (*Brahea* sp.), has a palm-thatched roof and lies close to the ground. In southwestern Guerrero, this type is found only occasionally. Here it is usually built on pillars of medium height and with a roof supported on independent posts.

6. *Cincalli*, highland crib. The present distribution of this granary, previously mentioned by Starr (1899) among the Otomi Indians, is as follows: Federal District (Isabel Kelly, in correspondence), southern Mexico State and northern Morelos at Tres Cumbres. The amount of maize harvested by a family determines the number and size of the granaries built. As the maize is consumed, the horizontal poles of the walls are taken down as far as the new level, and in this manner, by the time of the new harvest, the entire structure is practically torn down. A new structure is built each year perhaps as a preventive measure against the concentration of insects. Redfield (1930) gives the Nahuatl name as *zincolohtli*, and Starr (1899) gives the Otomi name as *cincalote*.

7. Completely cylindrical, upright poles. This is the dominant type among the Amuzgos of southeastern Guerrero. It is very similar to the structures found by Starr (1899) among the Triquis directly north of the Amuzgo area. A. Perez Toro (1922) suggests that these circular constructions indicate a cultural influence of the negro population; however, it is clearly of local origin. This type (Pl. XX, B) is reported also from Tlacotepec, Guerrero (Weitlander and Barlow 1944).

8. Maguey hut (Pl. XX, C). This structure is built much the same as a small scale model of a regular hut with a floor slightly raised above the ground and a two-pitched roof. The adaptation to the local semi-arid conditions of southern Puebla where it is used is complete, as it is built almost entirely of the different parts of the maguey plant (*Agave* spp.).

9. *Troje*, wattle and daub sealed structure (Pl. XXI, A, B). This type of granary has its main area of distribution in the State of Guerrero (entire Balsas River basin, Zumpango del Rio, and towns of "la Sierra"), although in former periods it was used over large parts of the tropical region along the Pacific coast. It is called *troje* in the lowland plains, and *cuescumal* in the upland towns. It is the most specialized and efficient type of granary found in the entire tropical region of Mexico, and its use has been extended to the storage of other crops such as sesame. Great variation exists as to shape, size and location of the *troje*, but the fundamental features of its construction are constant.

Hendrichs (1945) gives a complete illustrated description of these structures in his arresting and comprehensive study of the region formerly inhabited by the Cuiclatec Indians. The main features of the granary are as

follows: the shape may be cylindrical or cubical and it may have a roof which rests upon it or upon independent supports, but in any event, it consists of thick wattle and daub walls, floor and top so that it forms a perfectly sealed unit; the body of the granary is raised some distance from the ground level; the shelled maize is poured in through a small door cut through the top wall and sealed in after all of the harvest has been stored; removal is made periodically through a small hole close to the base of the structure and, after each withdrawal, this aperture is sealed in once more with daub.

10. Cylindrical, wattle and daub open granary. This simpler type of structure is found distributed along the northern limits of Guerrero, in the Mixtec area of eastern Guerrero (Schultze Jena 1938), the northwest region of Oaxaca (I. Kelly, in correspondence), and the southwestern part of Puebla. Throughout this area it is designated as *cuescumal*, *cuescomate* and *coscomate*.

11. Tropical crib. The use of the tropical maize crib, shown in Pl. XVIII, B, C, predominates throughout most of the moist tropical areas of southern Veracruz, Tabasco, northern and southern Chiapas, Campeche, Yucatan, Quintana Roo and eastern Oaxaca. This structure has been amply described in its modern form by Lundell (1933), Wauchope (1938), Perez Toro (1942) and Morley (1946), from the Mayan area of the Yucatan Peninsula. E. Matuda (in correspondence) reports its use in southern Chiapas. I. Kelly (in correspondence) finds it aberrant among the Totonacs of northern Veracruz, while the author has seen it widely used in Tabasco and in the Chimalapa region of the Isthmus of Tehuantepec, Oaxaca.

This granary may be built within the yard of the house

or at the location of the "milpa" or maize planting. It is used to store maize in the husk and this may be thrown in haphazardly or carefully arranged in layers with the ears in a vertical or horizontal position.

12. Granary within the house. This method of storage has been found in use among the Totonacs (I. Kelly, in correspondence), the Maya of Tabasco, and the Zapotecs of the Isthmus of Tehuantepec, Oaxaca.

b. Temporary methods of maize storage

1. *Tapanco*, loft of house. This simple and effective method of storage is widely used throughout the tropical region. It is found among the Tarascans of Michoacan (D. Brand, in correspondence, G. Foster 1948), the Zapotecs of the Isthmus of Tehuantepec, Oaxaca, the Totonacs of northern Veracruz (I. Kelly, in correspondence), the Mayan groups of southern Mexico, and the farmers of the coasts of Guerrero and Jalisco.

2. *Enramada*. Throughout a large part of the coastal areas of Guerrero and Veracruz, where dry winter seasons prevail, the *enramada* serves for the storage of maize on the cob (Pl. XXI, C, D).

3. *Ziricua*, cylindrical reed container (Pl. XXII, B, C). Some variation occurs as to the kind of material used in building these containers. The most outstanding examples are found in Guerrero where they are called *ziricua* and *huatlal*. In the Balsas River Basin, the *ziricua* is usually made of stalks of *Tithonia* sp. (*acahual*, Hendrichs 1945). On the mountain slopes of Guerrero where Nahuatl-speaking groups have invaded the area, the *huatlal* is made of split bamboo canes (Hendrichs 1945). This type of granary is also found at Tixtla, Guerrero, among the Mixtecs at Cahuatachi, Guerrero (Schultze

Jena 1938), and among the Amuzgo Indians of southeastern Guerrero. The Nahuatl-speaking groups of Morelos use a similar structure called *ohuatlapilli* (Redfield 1930) made of cornstalks.

4. Non-specialized storage structures. Finally, due to the economic level of the population or to the breakdown of former patterns, several methods of maize storage which do not involve the use of specialized storage structures have been adapted in various regions. Some of these methods are: enclosures within the house, enclosures against the walls of the patio, sacks or mats, and stringers of maize ears hung on trees.

SUMMARY—MODERN PERIOD

<i>Granary Type</i>	<i>Indian Group</i>	<i>Distribution</i>
A. Permanent Hacienda Granaries		
1. Cylindrical, masonry		southern Chiapas
B. Family Maize Granaries		
a. Permanent and semi-permanent structures		
1. Cylindrical, stone-daub	Tarahumara	Son. and Chih.
2. <i>Cuezcomatl</i> , vasiform, grass-daub	Tlaxcalan Nahuatl (?)	Tlaxcala northern Morelos
3. Highland log-cabin	Tarahumara; Mixtec	Son. and Chih. n.w. Oaxaca
4. Yanhuitlan log-cabin	Mixtec	Yanhuitlan, Oaxaca
5. Lowland log-cabin	?	central and s.w. Guerrero
6. <i>Cincalli</i> , highland crib, <i>cincalote</i> , <i>zincolohtli</i>	Otomi (?) Nahuatl (?)	s. Mex. State n. Morelos, D.F.
7. Completely cylindrical, upright poles	Amuzgo ?	s.e. Guerrero s. Guerrero
8. Maguey hut	?	s.w. Puebla
9. <i>Troje</i> , wattle-daub sealed structure	Cuiclatec (?) Nahuatl (?)	w. Guerrero n.w. Guerrero

10. Cylindrical, wattle-daub open structure	Mixtec ?	e. and n. Guerrero, n. w. Oax., s. w. Puebla
11. Tropical crib	Mayan	Yucatan Peninsula, Tabasco, Chiapas, s. Veracruz, Oaxaca
12. Granary within house	Totonac	n. Veracruz
	Mayan	Tabasco,
	Totonac	n. Veracruz
	Zapotec	e. Oaxaca
b. Temporary methods of maize storage		
1. <i>Tapanco</i> , loft of house	Tarascan	Michoacan
	Zapotec	e. Oaxaca
	Totonac	n. Veracruz
	Mayan	southern Mexico
	?	Guerrero, Jalisco
2. <i>Enramada</i>	?	Guerrero, Veracruz
3. <i>Ziricua</i> , cylindrical reed	Cuiclatec (?)	w. Guerrero,
	Nahuatl (?)	n. Gro., n. Morelos,
	Amuzgo	s. e. Guerrero
4. Non-specialized struc- tures	?	Jalisco, Guerrero, Oaxaca, etc.

VIII. RESUMEN

El objeto del presente estudio es el de seguir el desarrollo de los graneros para maíz durante la historia de México, en este país adonde el maíz ha sido y sigue siendo la base principal del alimento humano. Como ya existen a la presente fecha suficientes datos para poder presentar un esquema preliminar de este desarrollo, es de esperarse que en un futuro no muy lejano se puedan establecer correlaciones significativas entre los tipos de graneros y las culturas indígenas de México. Estas correlaciones serían de gran utilidad para los investigadores agrícolas puesto que las culturas indígenas han actuado en parte como mecanismos aislantes favorables para la producción y conservación de ecotipos de maíz.

Con la introducción de este cereal a la economía agrí-

TABLE I
TENTATIVE CULTURAL AND TEMPORAL DISTRIBUTION OF MAIZE GRANARY TYPES
IN MEXICO

Granary Types	Archaeological Period (500-1100 A.D.)	Pre-Conquest Period (1100-1518 A.D.)	Post-Conquest Period (1520-1600 A.D.)	19th Century Period	Modern Period
A. Large Permanent Granaries					
a. Imperial Granaries					
1. Rooms		Aztec			
2. Log-cabin		Aztec; Mixtec			
3. <i>Cuezcómatl</i> , vasiform		Aztec; Mazapan; Tlaxcalan			
4. Cask-like, wattle-daub		Aztec			
b. Encomienda Granaries					
1. Log-cabin			Mixtec		
c. Hacienda Granaries					
1. Conical, adobe-mortar				Spanish ?	
2. Cubical, masonry				Spanish ?	
3. Cylindrical, masonry					Non-Indian
B. Family Granaries					
a. Permanent and semi-permanent					
1. Subterranean	Tarahumara				
2. Niches of caves	Tarahumara	Tarahumara	Tarahumara	Tarahumara	
3. Rectangular and cylindrical, stone and mortar	Tarahumara	Tarahumara	Tarahumara	Tarahumara Huicholes	Tarahumara
4. Wattle-clay daub	Tarahumara	Tarahumara	Tarahumara		
5. <i>Cuezcómatl</i> , vasiform	Tarahumara	Tarahumara			
		Aztec	Nahuatl	Nahuatl ?	Nahuatl ?
		Tlaxcalan	Tlaxcalan	Tlaxcalan	Tlaxcalan
		Mazapan	Mazapan	Cholulan ?	
6. Clay jars	Teotihuacan	Aztec; Cahita; Mayan ?			
7. Highland log-cabin		Aztec			
		Mixtec	Mixtec	Mixtec	Mixtec
				Tarahumara	Tarahumara
				Tepehuan	Tepehuan
				Cholulan ?	Cholulan ?
				Triquis	
				Zoques	
a) roof round					
b) roof on independent posts					
c) cabin on posts				Mixes	
d) cabin on posts and projecting ridge pole				Mazatecs	
				Cuicatecs	
				Chinantecs	
8. Yanhuitlan log-cabin			Mixtec		Mixtec
9. Lowland log-cabin					? Guerrero
10. <i>Cincalli</i> , highland crib		Aztec ?		Nahuatl	Nahuatl ?
11. Completely cylindrical				Otomi	Otomi
12. Square, upright poles				Triquis	Amuzgos
13. Maguey hut				Tepehuan	
14. <i>Troje</i> , daub-wattle, sealed				? Puebla	? Puebla
15. Cylindrical wattle-daub, open top					Cuiclatec ?
16. Tropical crib					Nahuatl ?
					Mixtec ?
					n.w. Oaxaca
					s.w. Puebla
					Mayan
					Totonac
17. Granary within house					Totonac
					Mayan
					Zapotec
b. Temporary and non-specialized					
1. Rafters		Aztec			
2. <i>Tapanco</i> , loft		Cahita		Chontales	Mayan
				Tarascan	Tarascan
				Zapotec	Zapotec
				Totonac	Totonac
				Huaves	
3. <i>Enramada</i>		Cahita			? , Guerrero
					Veracruz
4. Conical, corn-stalks				Cholulan?	
5. <i>Ziricua</i> , reed					Cuiclatec ?
					Nahuatl ?
					Amuzgo
					? Jalisco
					Guerrero
6. Non-specialized					Oaxaca, etc.

It has not been possible to establish definite cultural determinations in every case. This fact accounts for the inclusion of such terms as Tlaxcalan and Cholulan, and for the shift from the term Aztec during the Pre-Conquest period to Nahuatl for the later periods. In the column under the heading Modern Period, wherever it has not been possible to fix the cultural element to a specific Indian group, the distribution is given.

cola de los grupos indígenas de México, estos iniciaron su época de florecimiento cultural. Pero el cultivo del maíz traía en sí involucrado el problema de su almacenamiento. Apesar de las afinidades entre los numerosos grupos indígenas, las construcciones que se desarrollaron para solucionar este problema siguieron una evaluación variada que dió como resultado el sin número de formas de graneros que hoy se encuentran en las distintas regiones rurales de México.

La información sobre los graneros de maíz en México, obtenida de la literatura y las observaciones del autor, se ha dividido en cuatro épocas como sigue: I. Período Arqueológico (circa 500–1100 AD); II. Período Anterior a la Conquista (1100–1518 AD); III. Período Inmediato a la Conquista (1520–1600 AD); IV. Período del Siglo XIX; y V. Período Moderno. En cada época, se han dividido los diferentes tipos entre los comunales (tales como los del Imperio Azteca, de las Encomiendas y de las Haciendas) y los familiares (permentes y temporales). Adonde ha sido posible, se ha señalado bajo cada tipo de construcción la región adonde se encuentra y los grupos indígenas que lo utilizan. Los resúmenes bajo cada período indican la distribución cultural y geográfica de los varios tipos de graneros, mientras que la Tabla I presenta, en forma preliminar, la distribución cultural y temporal.

Los principales tipos de graneros familiares son como sigue: a) los *cuezcomatls* de Tlaxcala y Morelos; b) las cabañas de la Mixteca; c) el *cincalli* o *cincalote* de la zona elevada al sur del Estado de México; d) la *troje* de la región tropical de la Cuenca del Río Balsas, Guerrero; e) el jacal tropical de la zona Maya del sur de México; f) la *ziricua* de la región tropical de la Cuenca del Río Balsas, Guerrero; g) el *tapanco* y la *enramada* de las partes tropicales de ambas costas.

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EXPLANATION OF THE ILLUSTRATIONS

PLATE XIII. A. "Casas Grandes" archaeological remains of vasiform type of maize granary made by twisting long grass into a compact cable and laying it up one round upon another and then covering the wall with thick coats of plaster on inside and outside; Tarahumara Indians of Sonora and Chihuahua. B. "Casas Grandes" archaeological remains of vasiform type of maize granary; Tarahumara Indians of Sonora and Chihuahua. (A and B reproduced from C. Lumholtz 1902.)

PLATE XIV. A. Imperial granaries of the log-cabin type depicted in the Codex Mendoza as units of measure of the tribute required of the various conquered towns by the Aztec rulers during the pre-Conquest Period; figs. 21 and 22 show two of these structures, with representations of maize, beans and *quautli* (*Amaranthus caudatus*) seeds above; town glyph number 6 represents Cuezcomahuacan. B. *Cuezcomatl*, vasiform grass and daub granary used by the agricultural families of the Aztec Indians during the pre-Conquest period. The glyph of the conquered town number 11 shows this type of structure and signifies Cuezcomatlyyacac or "in the beginning of the granaries." C. *Cuezcomatl*, vasiform grass and daub granary depicted in the glyph of Cuezcomayxtlahuacan, conquered town number 19 and interpreted as "the place of the plain of bins." (A, B and C reproduced from the Codex Mendoza, Kingsborough 1831-1848.) D. *Cuezcomatl*, vasiform granary used by the Aztec Indians during the pre-Conquest period as shown in the Codicis; the glyph corresponds to the town of Cuezcomatl Iyacac. (Reproduced from the Historia Chichimeca, Boban 1891.)

PLATE XV. A. *Cuezcomatls*, vasiform maize granaries used by the farmers of Tlaxcala during the later part of the 19th Century. (Reproduced from Starr 1899.) B. Tlaxcalan *cuezcomatl*, vasiform type of maize granary used at present in decreasing numbers among the farmers of Tlaxcala; found at San Bernabe Amaxac de Guerrero, Tlax. C. Morelos *cuezcomatl*, vasiform granary used to store shelled maize; entrance is through the small gable-like opening near the top; the apex is usually terminated by an inverted clay pot.

PLATE XVI. A. storage of maize in large clay jars among the Aztec Indians during the pre-Conquest period. B. Highland log-cabin type of granary used by the Aztec Indians during the pre-Conquest period; note that the ears of maize shown are very similar to the Mexican pyramidal race which is still dominant in the area near Mexico City today. (A and B reproduced from Sahagun 1529-1590.)

PLATE XVII. A. Log-cabin type of family granary used by the Mixtec Indians of Tilantongo, Oaxaca during the later part of the 19th Century. B. Log-cabin type of family granary used by the Mixe Indians of Oaxaca during the later part of the 19th Century; the entire structure is built on four corner pillars of medium height. C. Log-cabin type of family granary used by the Mazatec Indians of Huautla, Oaxaca during the later part of the 19th Century; the entire structure is built on tall corner pillars, and the projecting ridge poles of the roofs are very characteristic. (A and C reproduced from Starr 1908; B from Starr 1899.) D. Yanhuitlan log-cabin type of family granary very similar to the ones depicted in the Yanhuitlan Codex; found rarely at present among the Mixtec Indians of Yanhuitlan, Oaxaca.

PLATE XVIII. A. *Cincalli, cincalote*, highland crib-type of maize granary used by the Otomi Indians of Huixquilucan, Mexico, during the later part of the 19th Century; the number and size of the structures varies with the amount of maize harvested by the family during the year. (Reproduced from Starr 1899.) B. Tropical crib, dominant type of maize granary used at present over an extensive area including southern Veracruz, Tabasco, Chiapas, Oaxaca, and all of the Yucatan Peninsula; Mayan Indians. (Photographed by Dr. A.J. Sharp, at Finca La Gloria, Oaxaca.) C. Crib-type of maize granary, variant form made of sturdy palm trunks, found close to Veracruz City, Veracruz. (Photograph by Dr. P. C. Mangelsdorf.)

PLATE XIX. A. Hacienda granaries, conical adobe-mortar type found over a small area of Zacatecas, Aguascalientes and eastern Jalisco; photograph shows the spiral stairways leading to the aperture near the apex. B. Hacienda granary, conical adobe-mortar structure showing the outlet door at the base. (Photographs by Dr. P. C. Mangelsdorf.)

PLATE XX. A. Completely circular structure used for storage of maize by the Triqui Indians of Oaxaca during the later part of the 19th Century. (Reproduced from Starr 1899.) B. Completely circular maize granary used by the Amuzgo Indians of southeastern Guerrero; Modern Period. C. Maguey hut type of maize granary used at present by the farmers of southeastern Puebla; the entire structure with the exception of the corner posts is made from different parts of the maguey plant (*Agavesp.*). (Photograph by Dr. P. C. Mangelsdorf.)